

ECHO System and Data Model Overview

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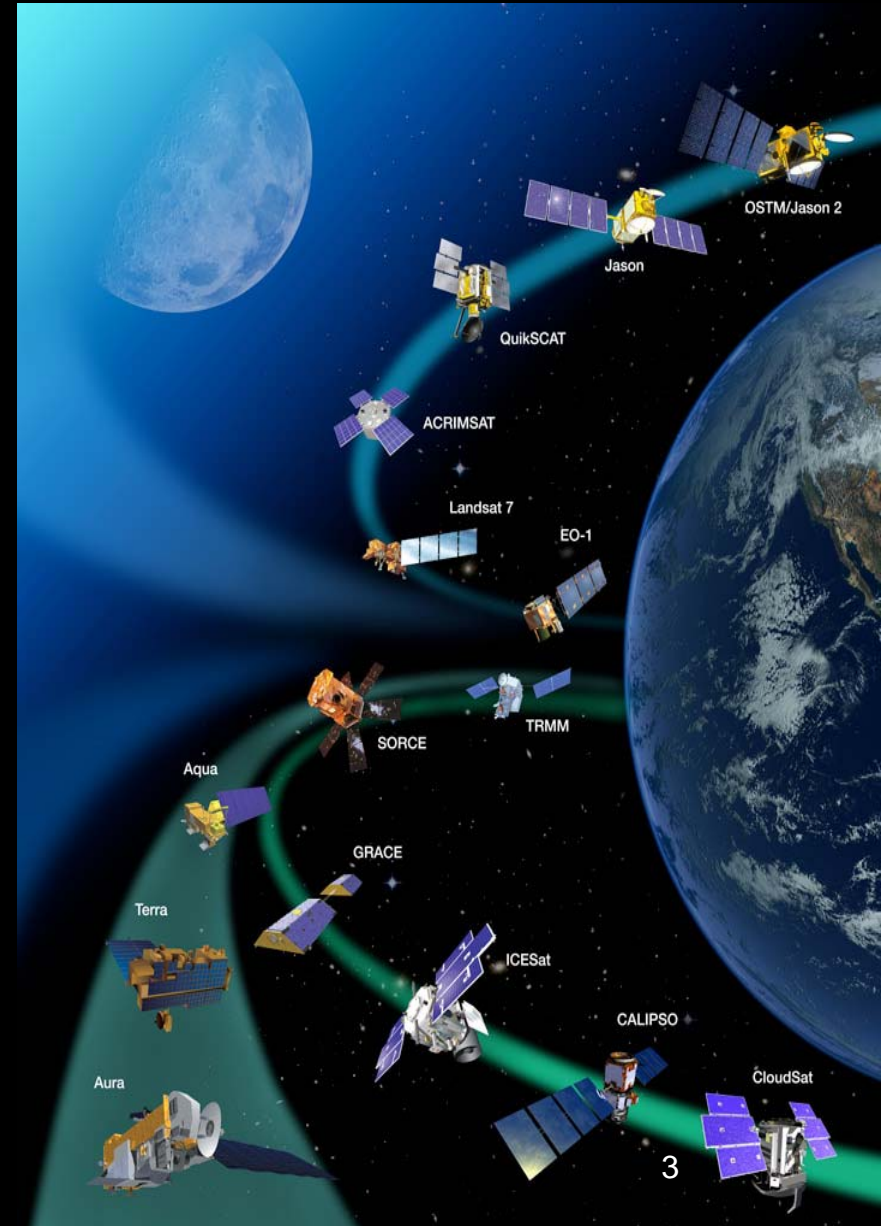
Coordinating NASA's Earth Observing System

- NASA's Earth Observing System (EOS)
 - Mission is to collect Earth remote sensing data for global change research program
- NASA's Earth Observing System Data and Information System (EOSDIS)
 - A petabyte-scale archive of environmental data that supports global climate change research
 - Designed to receive, process, distribute and archive several terabytes of science data per day
 - Provides a distributed information framework supporting EOS investigators and other users
 - Open Data Policy – Data are openly available to all and free of charge except where governed by international agreements
 - By having open application layers to the EOSDIS framework, we allow many other value-added services access to NASA's vast Earth Science Collection
 - Interoperates with data archives of other agencies and countries



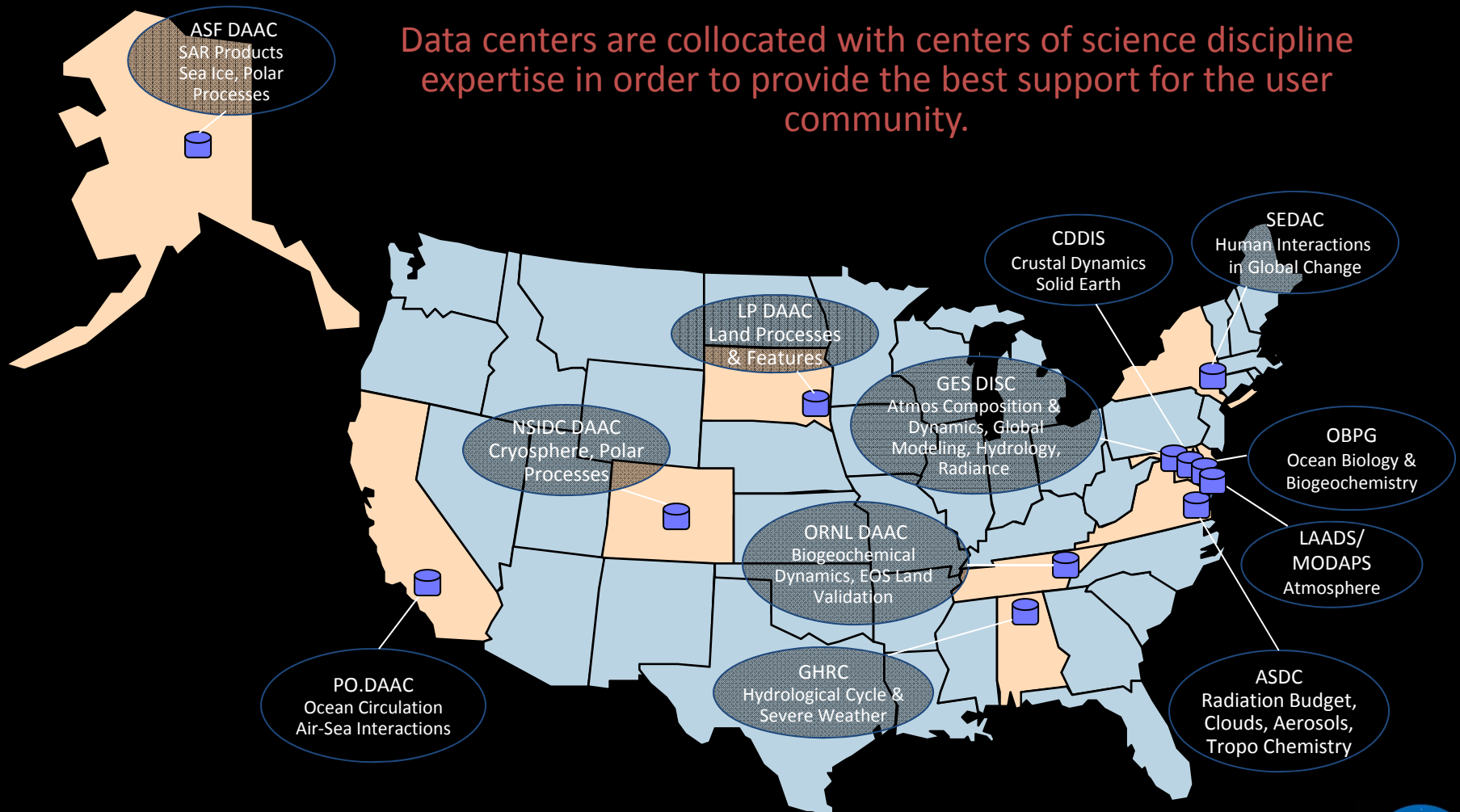
Extensive Data Collection

- NASA's Earth Observing Satellites (EOS) monitor daily events and long term environmental changes
- EOSDIS data collection includes over 3,500 data types
- Land
 - Cover & Usage
 - Surface temperature
 - Soil moisture
 - Surface topography
- Atmosphere
 - Winds & Precipitation
 - Aerosols & Clouds
 - Temperature & Humidity
 - Solar radiation
- Ocean Dynamics
 - Surface temperature
 - Surface wind fields & Heat flux
 - Surface topography
 - Ocean color
- Cryosphere
 - Sea/Land Ice & Snow Cover
- Human Dimensions
 - Population & Land Use
 - Human & Environmental Health
 - Ecosystems



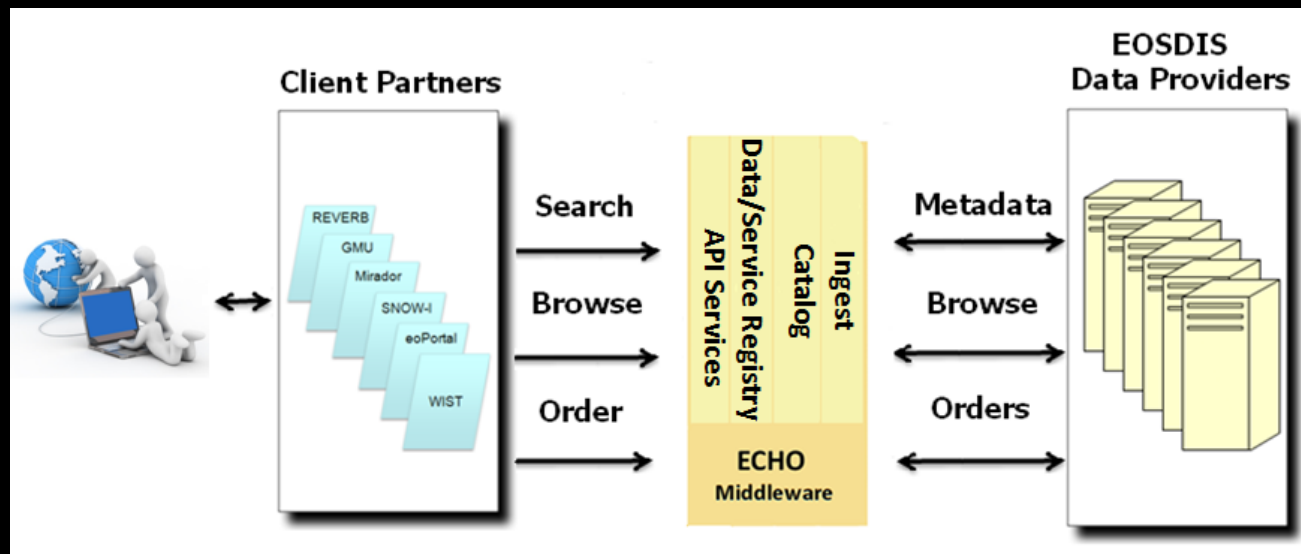
Distributed Centers of Expertise

Data centers are collocated with centers of science discipline expertise in order to provide the best support for the user community.



ECHO Architecture

- ECHO is NASA's middleware layer between Earth science data and users via a service-oriented architecture. Designed to improve the discovery and access of NASA data.



Developed as a part of NASA's core data systems but fully adaptable to the needs/requirements of science communities.

- Acts as an order broker between end users and EOSDIS Data Centers who provide metadata for their data holdings and other Earth science-related data holdings.
- User-defined specialized "clients" can be easily developed to give science data users of their community access to data and services using ECHO's open APIs.

Next Generation Client - REVERB



- Reverb is the primary web-based client for discovering and ordering cross-discipline data from all of ECHO's metadata holdings.
- Reverb allows users, including those without specific knowledge of the data, to search science data holdings, retrieve high-level descriptions of data sets and detailed descriptions of the data inventory, view browse images, and submit orders via ECHO to the appropriate data providers.
- Users are able to submit queries using spatial and temporal criteria and examine search results for relevancy using built-in tools.
- Exposes the ECHO service registry with relevant ECHO metadata

<http://reverb.echo.nasa.gov/reverb>

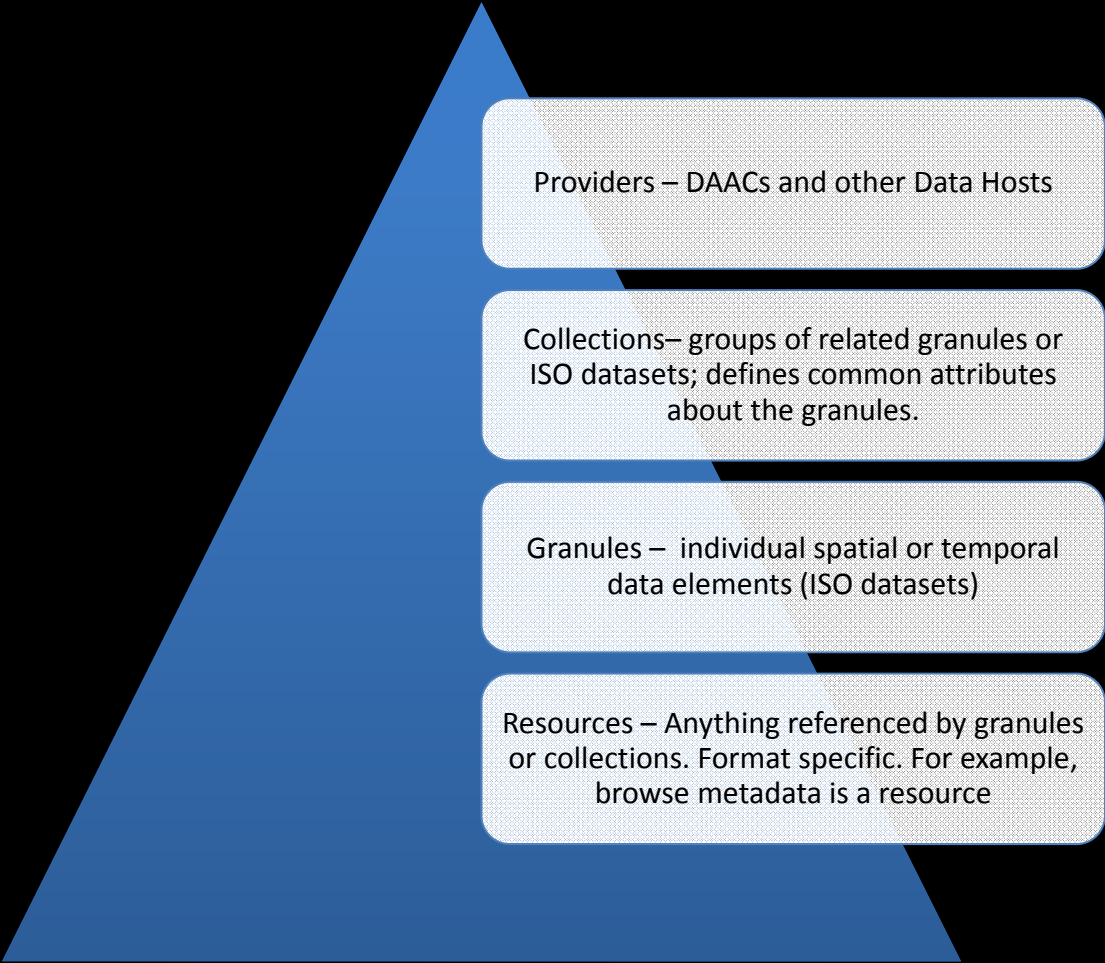


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METADATA CONCEPTS



Some Definitions

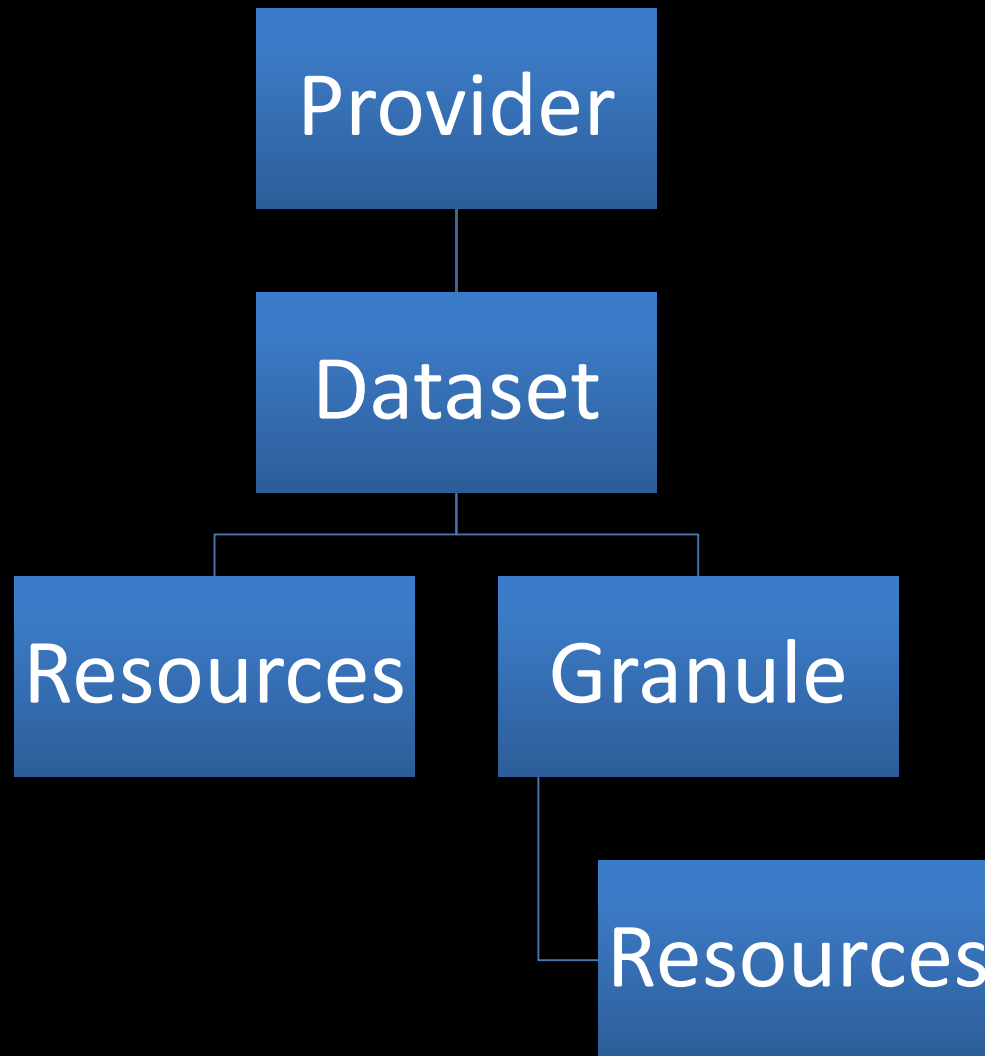


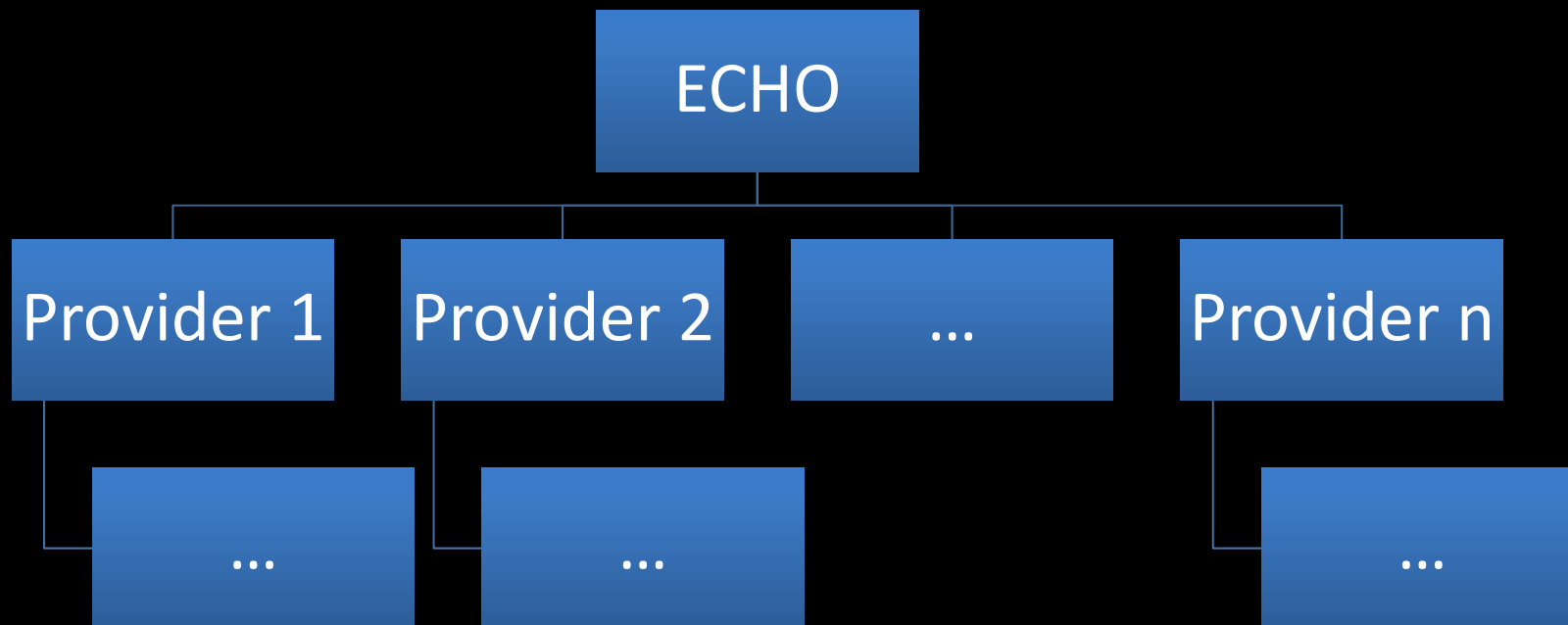
Providers – DAACs and other Data Hosts

Collections– groups of related granules or ISO datasets; defines common attributes about the granules.

Granules – individual spatial or temporal data elements (ISO datasets)

Resources – Anything referenced by granules or collections. Format specific. For example, browse metadata is a resource

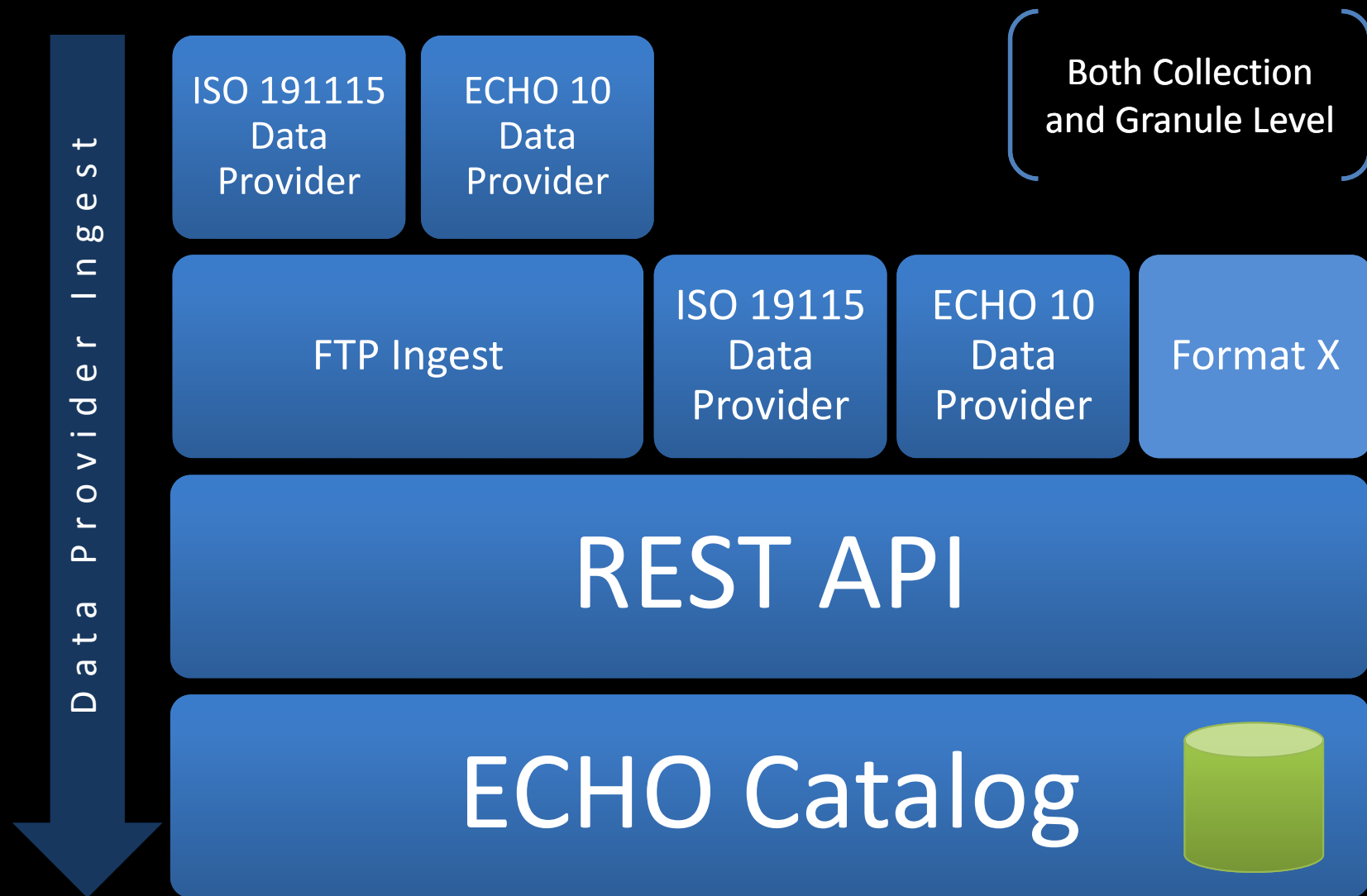




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DATA FLOW





Client Data Retrieval

Reverb

Mirador
Giovanni
...



ESIP
OpenSearch

Direct
Clients

REST API

- Searching
- Ordering

- Multi-format Retrieval
 - ECHO10
 - JSON
 - ISO 19115

ECHO Catalog

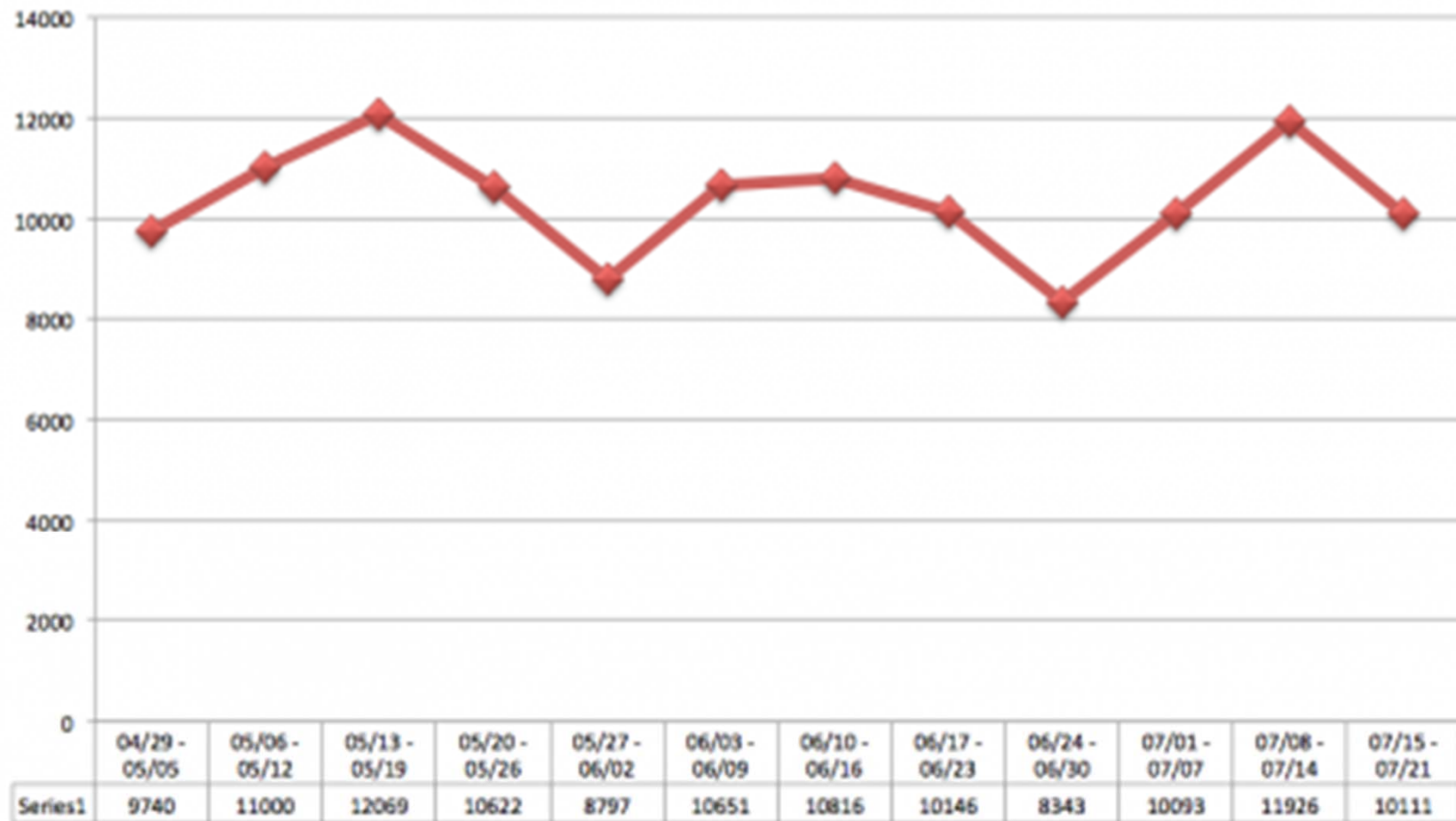


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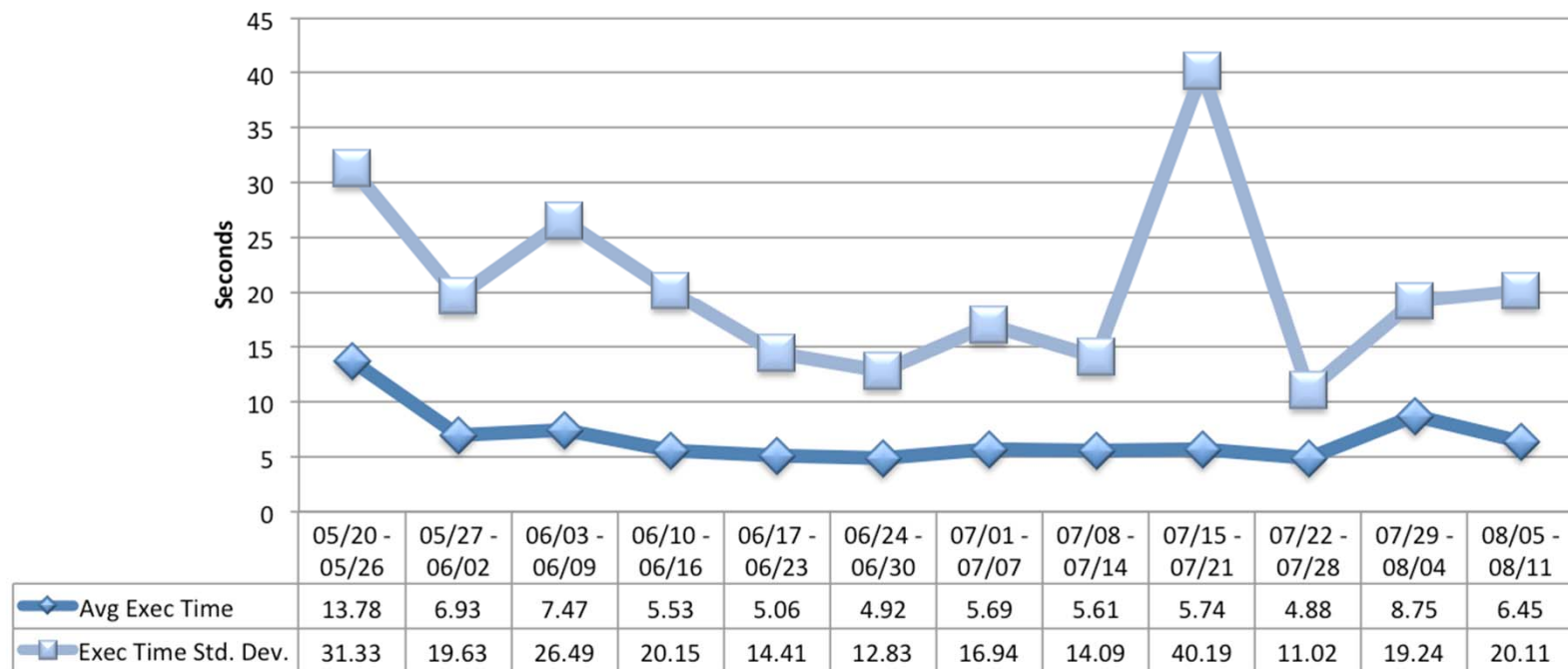
USAGE METRICS



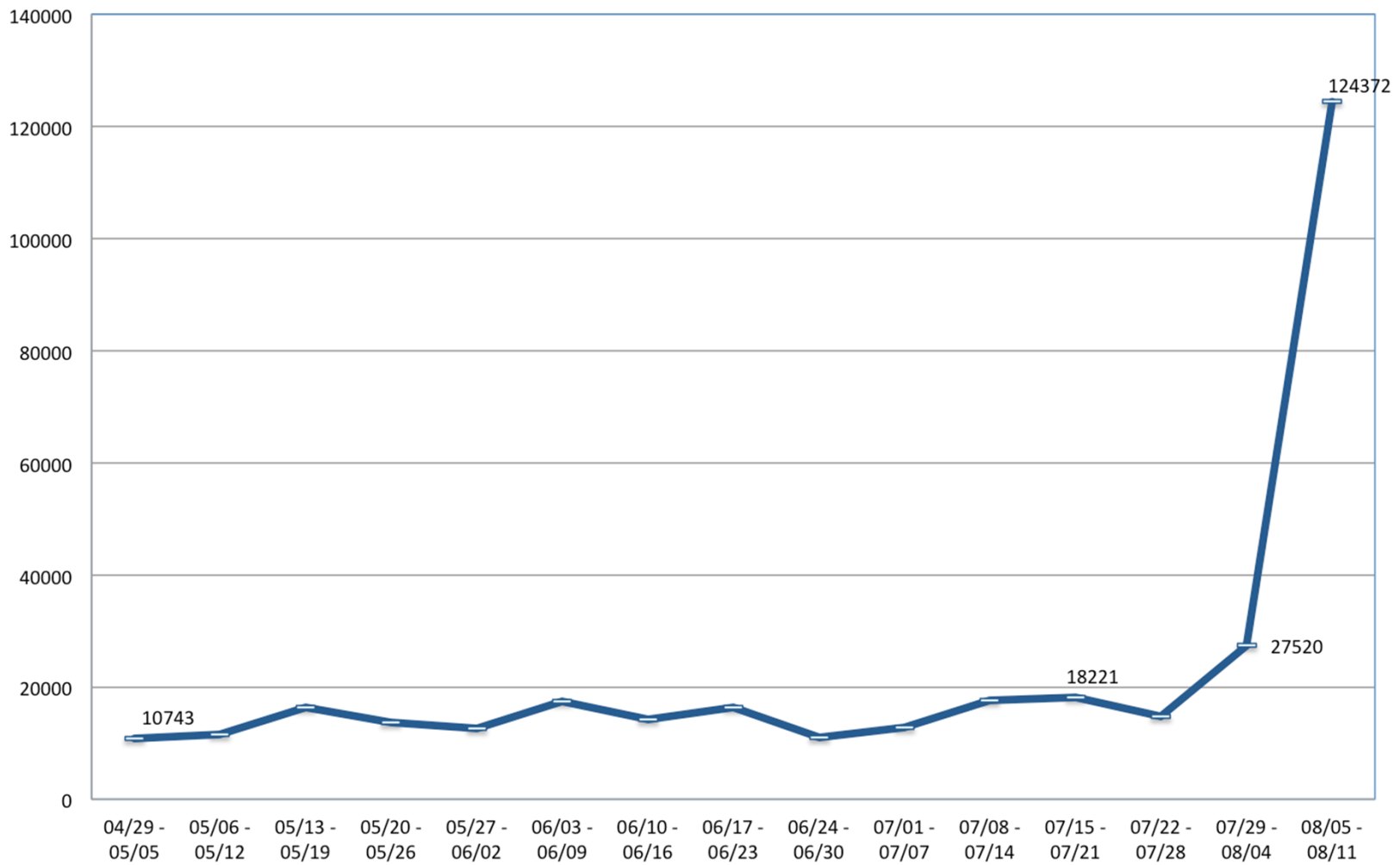
Reverb Granule Queries



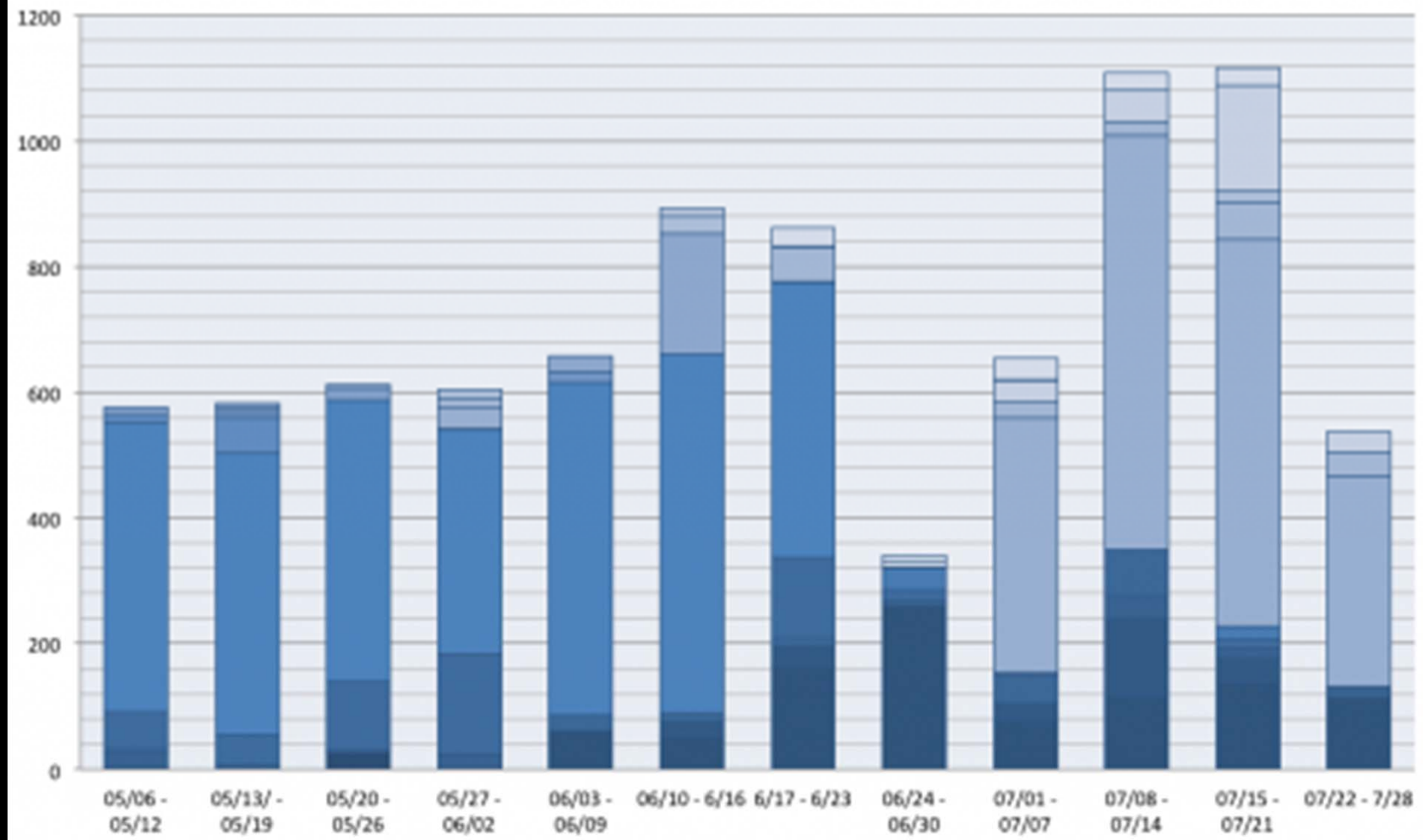
Average Query Performance



Total ECHO Queries by Week, All Clients



ECHO OpenSearch Queries By Week

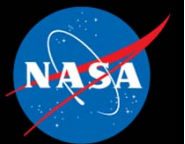


- **Data Metrics Weekly Activity Metrics**
 - >99.9% Uptime
 - 2TB Data Index covering PBs of data
- Current Public Holdings:
 - Collections: 2798
 - Granules: 105 million
 - Growing by ~100k granules/week
- Other Fun Facts
 - 60K+ registered users, utilizing EOSDIS URS
 - 12 Active Data Partners
 - 34 million ECHO hosted Browse Images
 - 11 Operational Clients
 - Several Clients in Test & Evaluation



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ENGAGEMENT AND FUTURE WORK



Embracing Change

We understand that ECHO's data formats won't work for everyone.

That's OK.

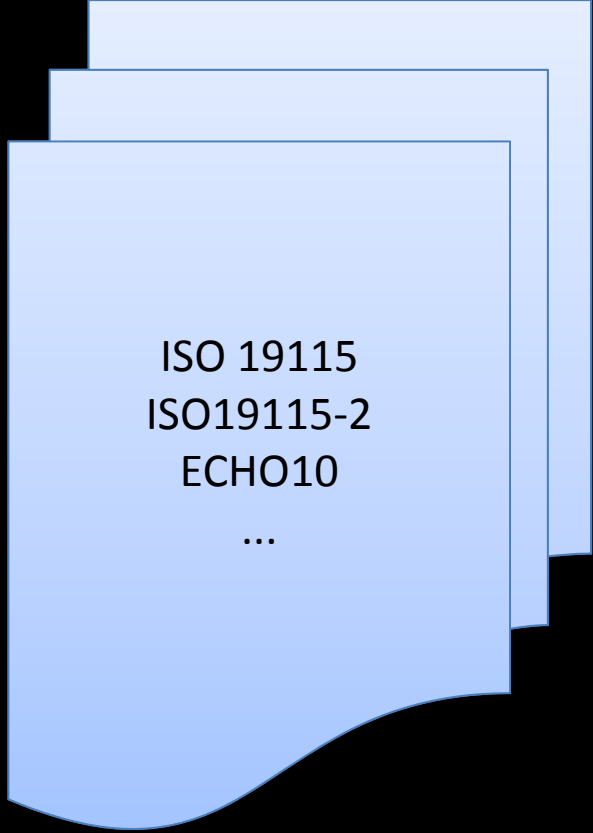
- Format Translators
- Format Indexers
- Retaining Pristine Format
- Validation/Verification Flexibility



Credit: FreeDigitalPhotos.net

Current Limitations (Future Opportunities)

- ISO 19115 is based on a snapshot
- Future Mission Planning: SMAP
- Validation is going to be a challenge, looking forward for collaboration and guidance
- Services Integration



ISO 19115
ISO19115-2
ECHO10
...

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QUESTIONS?

